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DECEMBER 1973, No. 12

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SOUTHWEST FISHERIES CENTER
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FISHING INFORMATION

DECEMBER 1973, No. 12

B. J. Rothschild, Director, SOUTHWEST FISHERIES CENTER
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PREFACE

This publication, Fishing Information, appears monthly and contains 1) fishery advisory information, 2) a narrative description of pertinent surface temperature conditions, 3) a narrative description of subsurface temperature structure for parts of the North Pacific, 4) charts of winds and pressures for the eastern North Pacific, 5) charts of sea surface temperature for the North Pacific and eastern tropical Pacific, and 6) charts of subsurface temperature structure in the eastern North Pacific.

A supplement to Fishing Information appears at 15-day intervals throughout the year. This is a chart of sea surface temperature (contoured at 2°F (1°C) intervals) from Baja California to Vancouver Island out to about 135°W. Special bulletins are published in conjunction with the 15-day sea surface temperature charts which include short-term projections of albacore distribution and locations of productive fishing areas, information on oceanographic and atmospheric conditions, and other information as is appropriate during the albacore fishing season.

L. E. Eber, Leader
Fishery Information Systems
Southwest Fisheries Center
La Jolla, California

Submitted for publication - January 21, 1974

CONTENTS

PAGE

Acknowledgements iv

Sea Surface Temperature and Environmental Conditions - December 1973, L. Eber and F. Miller 1

Subsurface Temperature Structure in the Northeast Pacific Ocean, J.F.T. Saur 2

ENVIRONMENTAL CHARTS, PACIFIC OCEAN - DECEMBER 1973

Figure 1. Thirteen-year mean (1961-73) observed sea level values of barometric pressure (millibars), resultant wind direction (degrees true), resultant wind speed (knots) and average wind speed (knots) regardless of direction 4

Figure 2. Observed sea level values of barometric pressure (millibars), resultant wind direction (degrees true), resultant wind speed (knots) and average wind speed (knots) regardless of direction 5

Figure 3. Mean sea surface temperature, eastern North Pacific Ocean. Squares show temperatures at weathership stations. Numerals on shore are temperatures at coastal and lightship stations 6

Figure 4. Mean sea surface temperature chart, western North Pacific Ocean 7

Figure 5. Deviation of sea surface temperatures, eastern North Pacific Ocean from 20-year mean (1948-67). Hatched areas are colder in 1973. 8

Figure 6. Deviation of sea surface temperatures, western North Pacific Ocean from 20-year mean (1948-67). Hatched areas are colder in 1973. 9

Figure 7. Deviation of sea surface temperatures, eastern North Pacific Ocean from those of December 1972. Hatched areas are colder in 1973. 10

Figure 8. Deviation of long-term chart H.O. 225 from new base period 1948-67 (20-year mean). Shaded areas indicate 20-year mean colder than H.O. 225 11

Figure 9. Mean sea surface temperatures, eastern tropical Pacific Ocean. Numerals on shore are temperatures at coastal stations 12

Figure 10. Deviation of sea surface temperatures, eastern tropical Pacific Ocean from 20-year mean (1948-67). Shaded areas are colder in 1973. Contours are dashed in sparse data areas 13

Figure 11. Surface temperature and salinity and subsurface temperature structure from expendable bathythermograph observations between San Francisco and Honolulu: November 24-27, 1973 14

Figure 12. Surface temperature and salinity and subsurface temperature structure from expendable bathythermograph observations between San Francisco and Honolulu: December 8-12, 1973 15

Figure 13. Surface temperature and salinity and subsurface temperature structure from expendable bathythermograph observations between Los Angeles and Honolulu: November 30-December 3, 1973 16

Figure 14. Surface temperature and salinity and subsurface temperature structure from expendable bathythermograph observations between Los Angeles and Honolulu: December 14-18, 1973 17

ENVIRONMENTAL CHARTS ANALYZED BY:
L. Eber (Figures 4 and 6), F. Miller (Figures 9 and 10)
J. Renner (Figures 1, 2, 3, 5, 7, and 8), J.F.T. Saur (Figures 11, 12, 13 and 14)

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K. Raymond

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National Weather Service, San Diego, California
National Ocean Survey, Pacific Marine Center, Seattle, Washington
Pacific Environment Institute, Fisheries Research Board of Canada, West Vancouver, British Columbia, by L.F. Giovando from observations by S.G. Westhaver at Langara Island Light; D.L. Kupillas at Cape St. James Light; L. Collins at Kains Island Lightstation; O.A. Edwards at Amphitrite Point Light
Scripps Institution of Oceanography, La Jolla, California, by Margaret Robinson
Fishing vessel, Trinidad

Expendable bathythermograph observations are made by the mates of the S.S. Hawaiian Enterprise of Matson Navigation Co. The data are processed under supervision of Dr. D.R. McLain at the NMFS Pacific Environmental Group Monterey, using computer facilities of the Fleet Numerical Weather Center. The project is partially supported by the National Science Foundation and the Office of Naval Research under Government Order NAonr-9-74.

Sea Surface Temperature and Environmental Conditions

L. EBER AND F. MILLER

Eastern North Pacific

Seasonal cooling from November to December 1973 was below normal in most areas of the eastern North Pacific. In December, negative deviations of sea surface temperature generally prevailed in waters from the coast out to 150°W, but were lower than in November. Sea temperature deviations were mostly positive in the region west of 160°W, exceeding 2°F (1.1°C) in some areas between 30° and 45°N (Figure 5). Exceptions to this warming tendency occurred off coastal areas south of 35°N, where temperatures remained 2°-4°F (1.1°-2.2°C) below normal, and in the neighborhood of Hawaii, where temperatures dropped from above to below normal.

A remarkably stable atmospheric circulation pattern prevailed during the month. It was characterized by one high pressure cell centered at 30°N, 130°W, a second high pressure cell west of 170°W and a succession of lows reaching their maximum intensity in the vicinity of 50°-55°N, from longitude 160°W into the Gulf of Alaska. The monthly mean sea level pressures in this region were, consequently, as much as 10 millibars below normal (Figures 1 and 2). The resultant winds between this region of low pressures and the high pressure cell off southern California had stronger southerly components than normal. This contributed to retardation of seasonal cooling through reduced evaporative heat loss and increased heat advection by wind driven surface transport.

Western North Pacific

Warmer than normal sea surface temperatures, shown in the eastern North Pacific west of 160°W, extended also into much of the western North Pacific in December 1973 (Figure 6). Negative deviations of surface temperature occurred in the region west of 160°E between latitudes 25°-40°N, and off southern Kamchatka and the Kurile Islands, eastward to about 300 miles. The pattern of anomalous temperatures continued to be weak and deviations exceeded 2°F (1.1°C) only in a few scattered areas.

Eastern Tropical Pacific

Sea surface temperature in December 1973 represent a marked contrast with those in December 1972 when the El Niño warming reached a peak off the coast of South America and along the equator. For example, sea surface temperatures this month (Figure 9) were as much as 10°F (5.5°C) below the December 1972 values in the Ecuador coastal and equatorial upwelling areas. The temperature anomalies (Figure 10) were equal to but opposite in sign to those a year ago in the Peru Current and its equatorial extension. The persistent high pressure off the coast of South America in December 1973 has maintained steady southeast trade winds which helped to induce upwelling in the Peru Current and along the equator. Strong equatorial temperature fronts now exist on both sides of the upwelling area (Figure 9).

North of the equator there has been a cooling of surface temperatures somewhat in excess of expected seasonal cooling. West of Baja and southward to 18°N, temperatures have been colder than normal for several months (Figure 10). Colder water, apparently associated with the California Current, moved farther south than usual; and strong north-south temperature gradients were found between the tip of Baja and the Revilla Gigedo Islands.

Cold water was observed in the Gulf of Tehuantepec and southward owing to frequent cold weather outbreaks into the Gulf of Mexico in December 1973. Strong northerly winds associated with the outbreak caused considerable ocean mixing in the Tehuantepec area and in the area west of Costa Rica where upwelling became a very noticeable feature.

Subsurface Temperature Structure in the Northeast Pacific Ocean

J.F.T. SAUR

Format Modification

In this issue we introduce a new format for presentation of data from expendable bathythermograph (XBT) observations taken in the northeast Pacific by merchant ships. The station chart showing the locations of observations has been expanded to provide for inclusion of additional tracks between Hawaii and several west coast ports. XBT observations between Honolulu and Los Angeles have been initiated on a regular basis and two sections along this new route are contained in this issue.

The horizontal scale along the top of the surface temperature and salinity graph is changed to indicate the distances from a point in the ship channel near Honolulu to points along the great circle route to a particular port. If a ship's track varies significantly from the great circle route, it will be noted in the discussion of the corresponding section.

Isotherms in the subsurface temperature sections are drawn to a depth of 460 m (1500 ft) which is the rated depth for the XBT probes now being used for most of the observations. The vertical exaggeration (ratio of vertical to horizontal scales) in these sections will be the same for all routes.

The selected station profiles have been replaced by a graph just below the subsurface temperature section which shows the temperature profiles for all observations. Each profile is drawn such that it intersects the line representing the surface at the point corresponding to the location of the observation in the isotherm section above. The profiles are intended as a visual aid in depicting variations in the temperature structure along the section. Vertical gradients can be determined by reference to the 10°C scale in the far left portion of the graph. The vertical profiles can be a tactical aid to albacore fishermen. By comparing profiles from on site XBT observations with those published here they may be able to locate the Transition Zone or associated frontal areas in which early season concentrations of migration albacore appear to occur.

The addition of the complete set of vertical profiles is made possible through computer program revisions by Dr. Douglas R. McLain of the NMFS, Pacific Environmental Group (PEG), Monterey. PEG processes the observations using facilities of the Fleet Numerical Weather Central (FNWC). The expendable probes are now being supplied by the FNWC Cooperative Oceanographic Observation Program directed by Paul D. Stevens. The NMFS project is a part of a coordinated program for XBT observations involving FNWC, NMFS and the NORPAX program at Scripps Institution of Oceanography. The project is made possible through the cooperation of various U.S. shipping companies and financial support from the National Science Foundation and Office of Naval Research under Government Order NAonr-9-74.

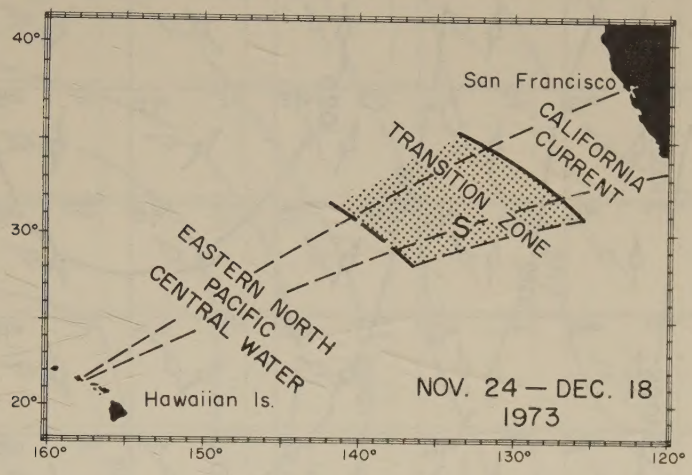
Description of Conditions

Observations of subsurface temperature structure were taken by the S.S. Hawaiian Enterprise on both the San Francisco-Honolulu and Honolulu-Los Angeles legs of two round trip voyages 15-days apart; the first (Voyage 78) spanned the last of November and the beginning of December and the second (Voyage 79) took place near mid-month. The data are presented for the San Francisco legs in Figures 11 and 12 and for the Los Angeles legs in Figures 13 and 14.

The location of the boundary between the Transition Zone and waters of the California Current is fairly well defined. On the San Francisco route the change in the vertical station profiles, a sharp westward increase in the depth of the 13° 15°C isotherms and an increase of the surface salinity gradient occur near 133° and 132°W, i.e., observations 6 and 7 in Figure 11 and observations 5 and 6 in Figure 12. On the Los Angeles route these changes occur near 122°-126°W, i.e., near observations 41-42 in Figure 13 and observations 43 and 44 in Figure 14.

The boundary between the Transition Zone and the Eastern North Pacific Central waters (ENP) is not well defined by the observations. Data taken on the San Francisco route during late November (Figure 11) show no consistent agreement among the various indicators of boundary location. Changes in the character of the profiles and in the surface salinity gradient, in the vicinity of observations 11 and 12 in Figure 12, may indicate a boundary near 141°W on the San Francisco route. On the Los Angeles route there is a change in the character of the vertical profiles and of the slope of the isotherms in the 150-250 m depth range near 138°W, i.e., associated with observations 35 and 36 in Figure 13 and observations 36 and 37 in Figure 14, which may be the boundary. The change in surface salinity gradient, however, occurs about 200 nautical miles coastward from this location in both sections, near 134°-135°W. Whether or not this should be interpreted as the boundary is unclear at this time, but may be resolved as more sections are acquired in the coming months.

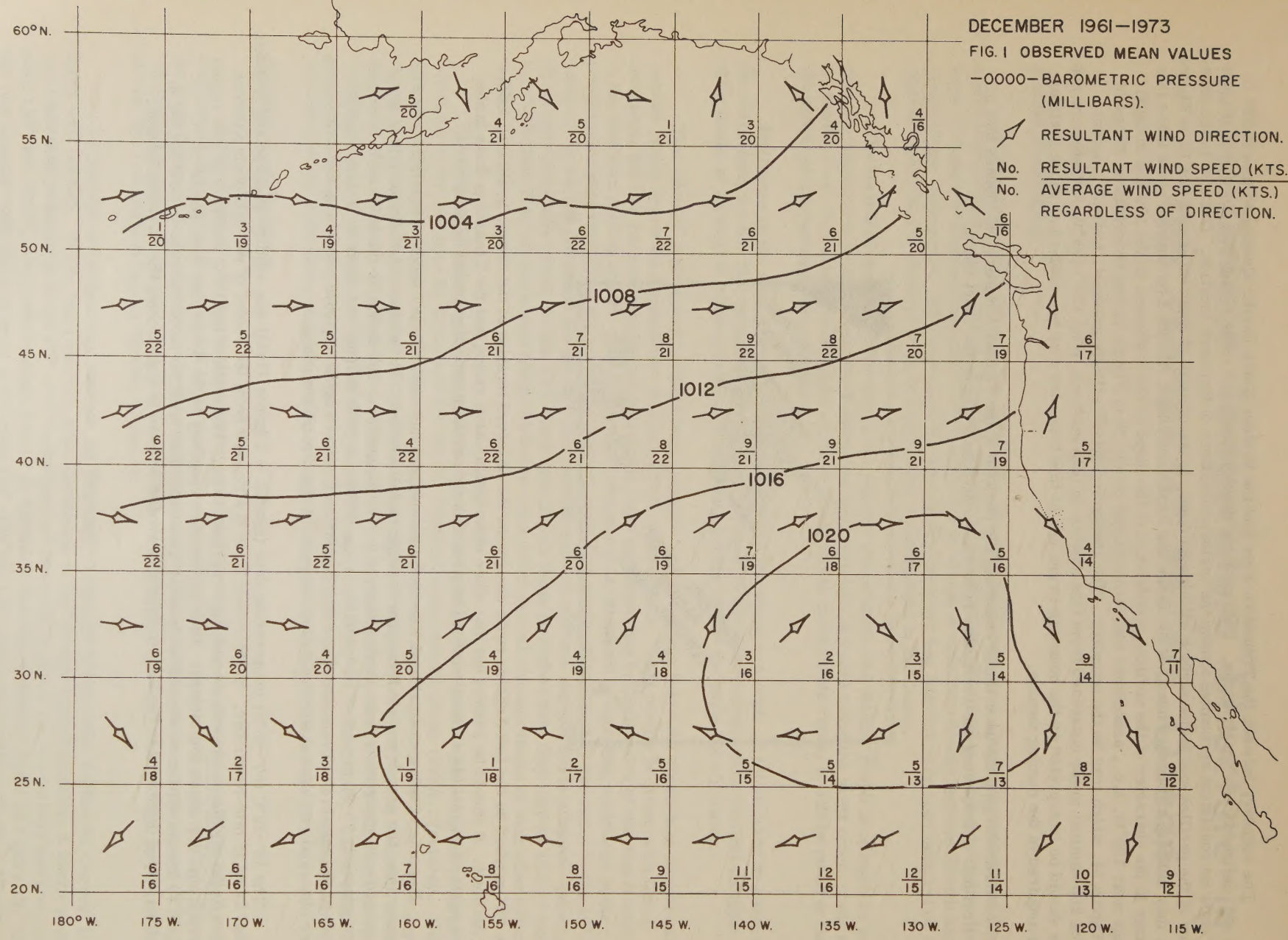
Acknowledging the uncertainty regarding the position of the western boundary, it appears that in the first half of December the Transition Zone was located as shown in the chart below.

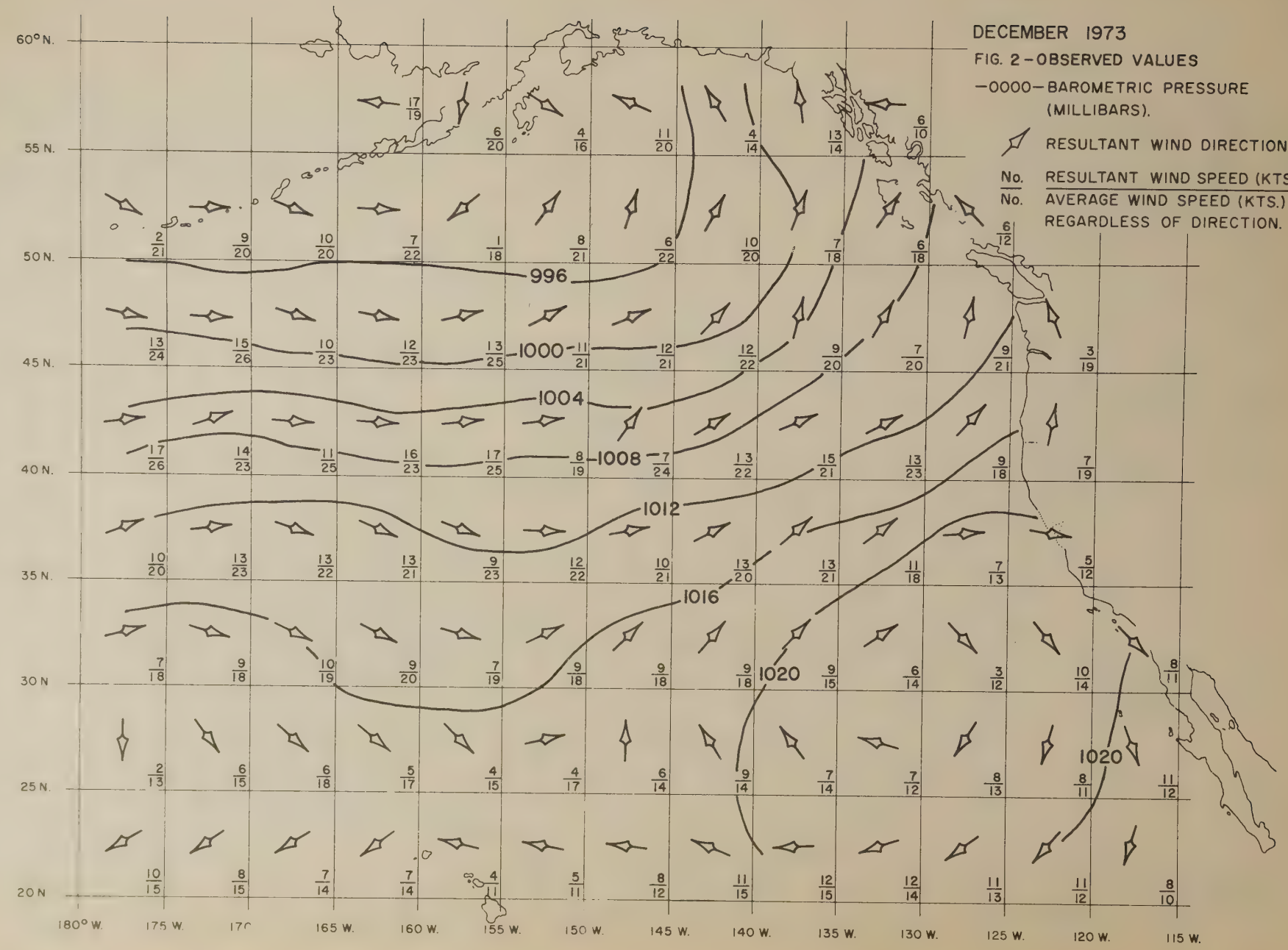


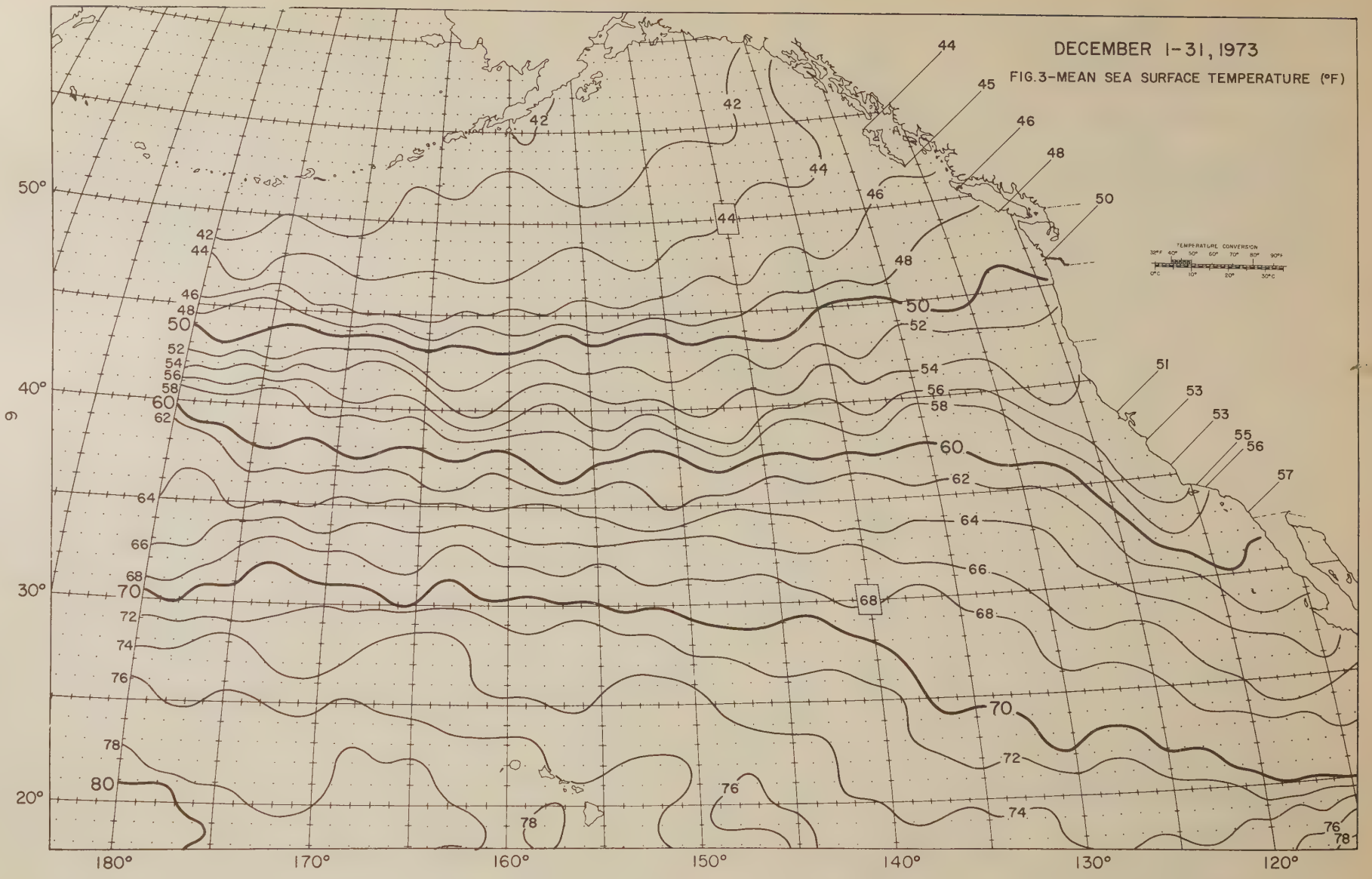
The "S" marked on the Los Angeles route designates the observed location of the change in surface salinity gradient. It should be pointed out that other observations have shown that the Transition Zone in the area north of Hawaii has an east-west orientation with the northern boundary generally near 40°N.

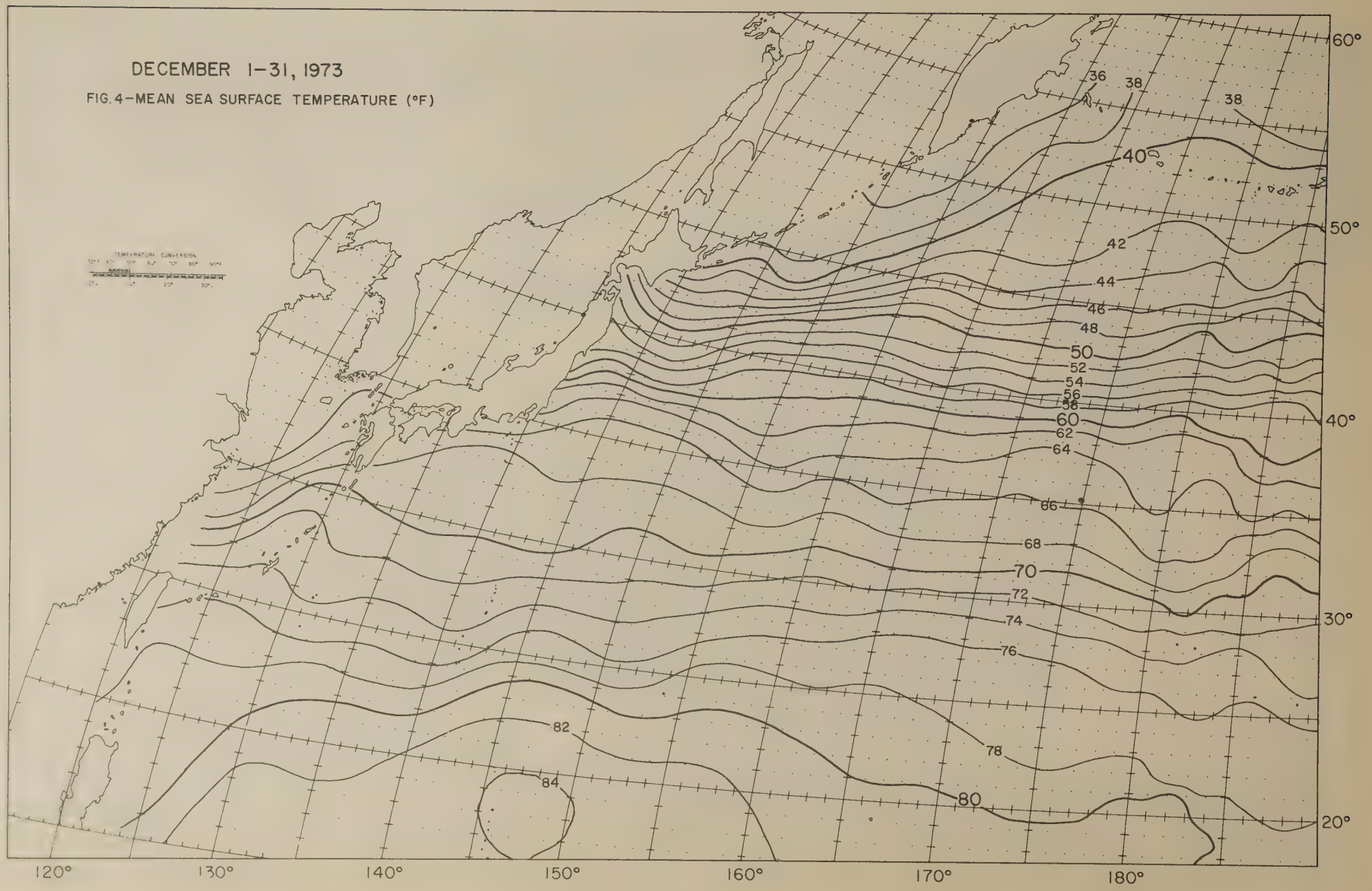
Because of below-normal heat loss to the atmosphere and reduced wind speeds associated with fair weather over the area from late November through mid-December, the depths of the surface mixed layer increased only moderately from those observed in mid-November. The depths of the layer on both routes were generally 75-90 m west of mid-section, i.e., mainly in ENP waters, but about 10 meters less (65-75 m) to the east in the Transition Zone and California Current region. In 1972, layers of 100-110 meters were observed just west of the Transition Zone on the San Francisco route.

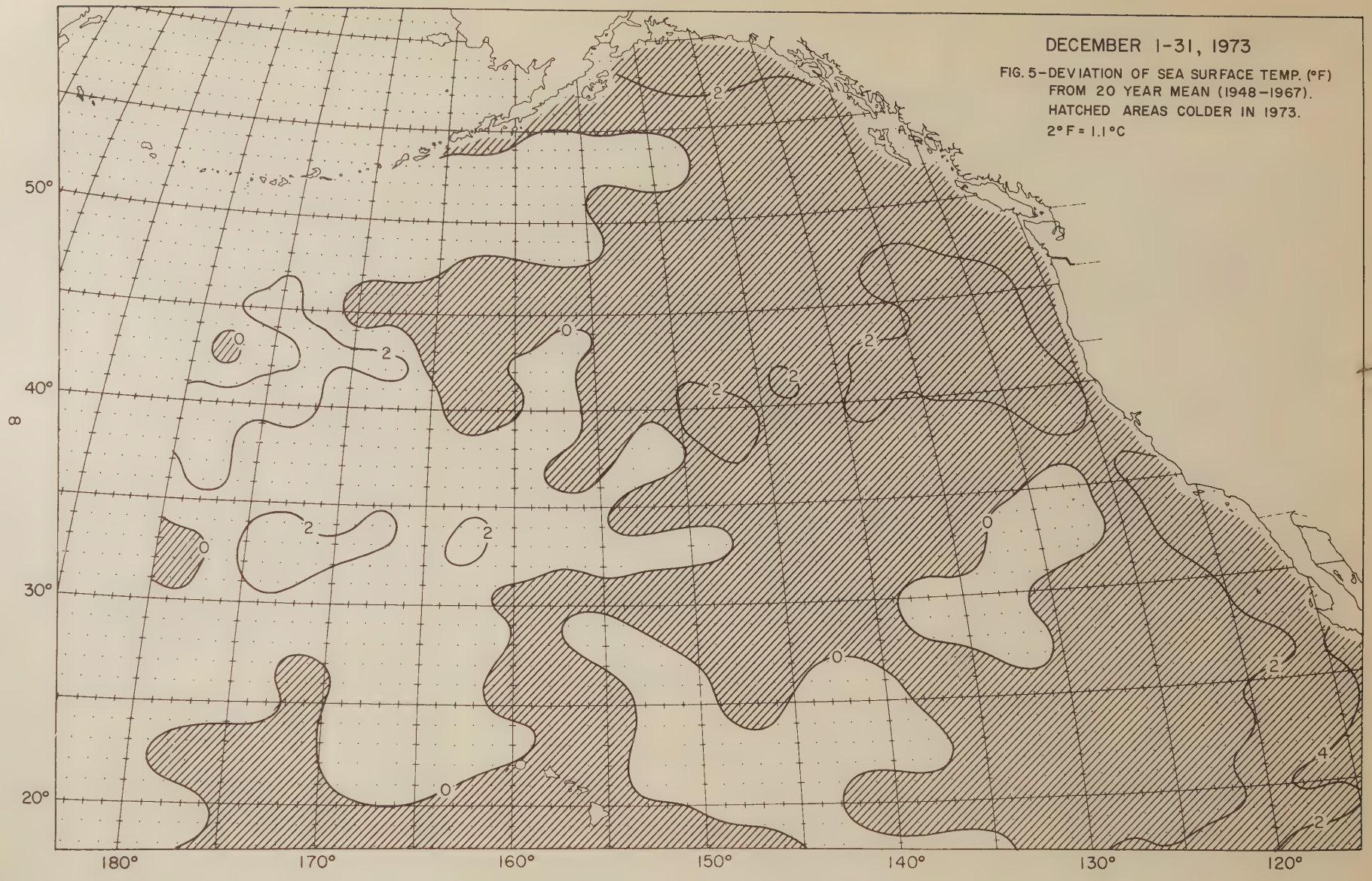
The 16°-19°C (60°-66°F) temperature zone (shaded in Figures 11-14) was similar in shape and location to that found in mid-November. In the mixed layer it stretched from the center of the California Current region to the middle or western part of the Transition Zone. The depth of the 16°C isotherm in this region varied from 70 to about 120 meters. Near the western boundary of the Transition Zone the 16°-19°C (60°-66°F) temperature zone descended beneath the mixed layer with the top of the zone around 90-100 m and then sloped downward to the west to depths of around 160-180 m approaching the Hawaiian Islands.

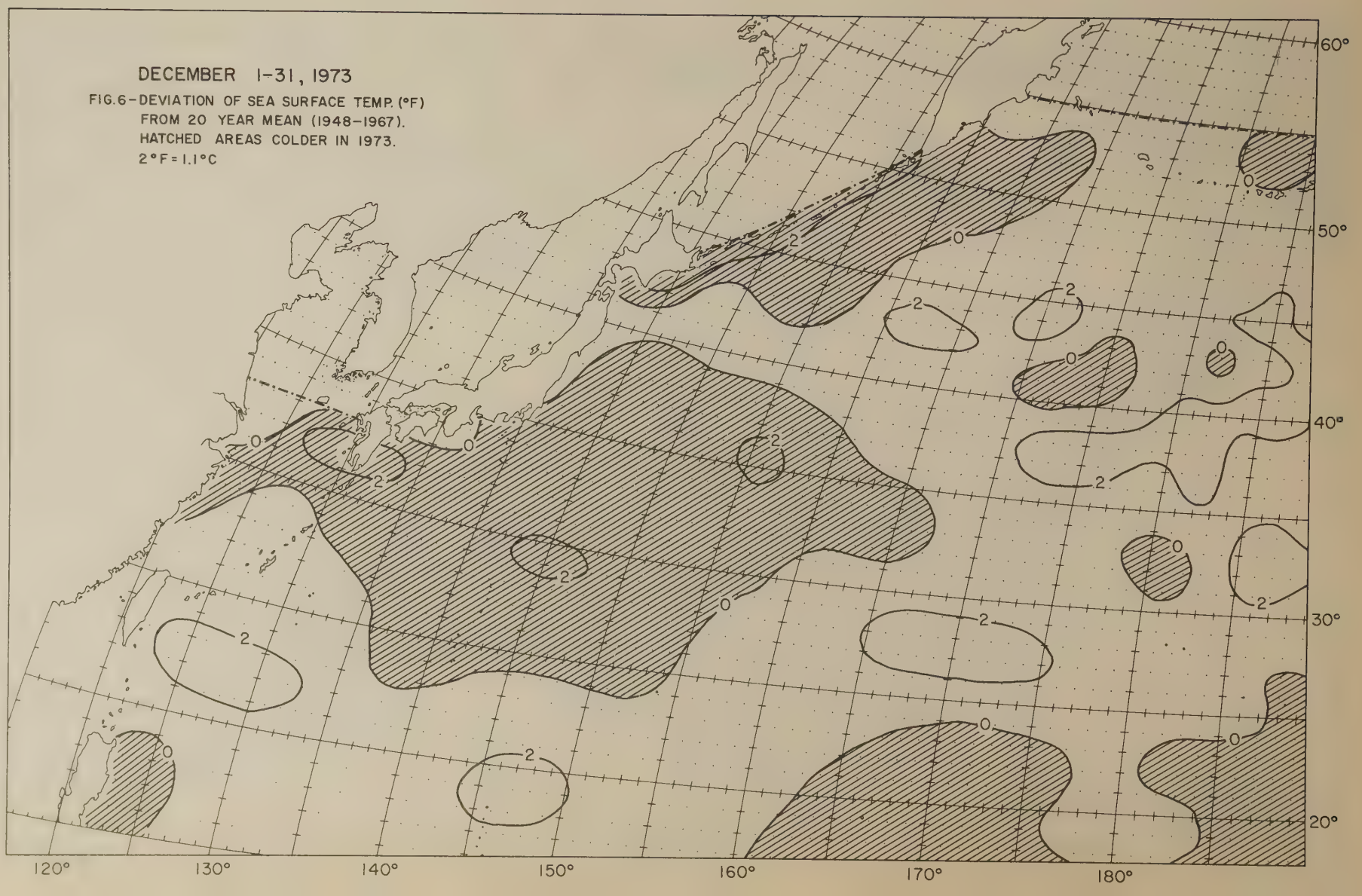

DECEMBER 1961—1973
FIG. 1 OBSERVED MEAN VALUES
—0000— BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.).
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1004
1008
1012
1016
1020
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

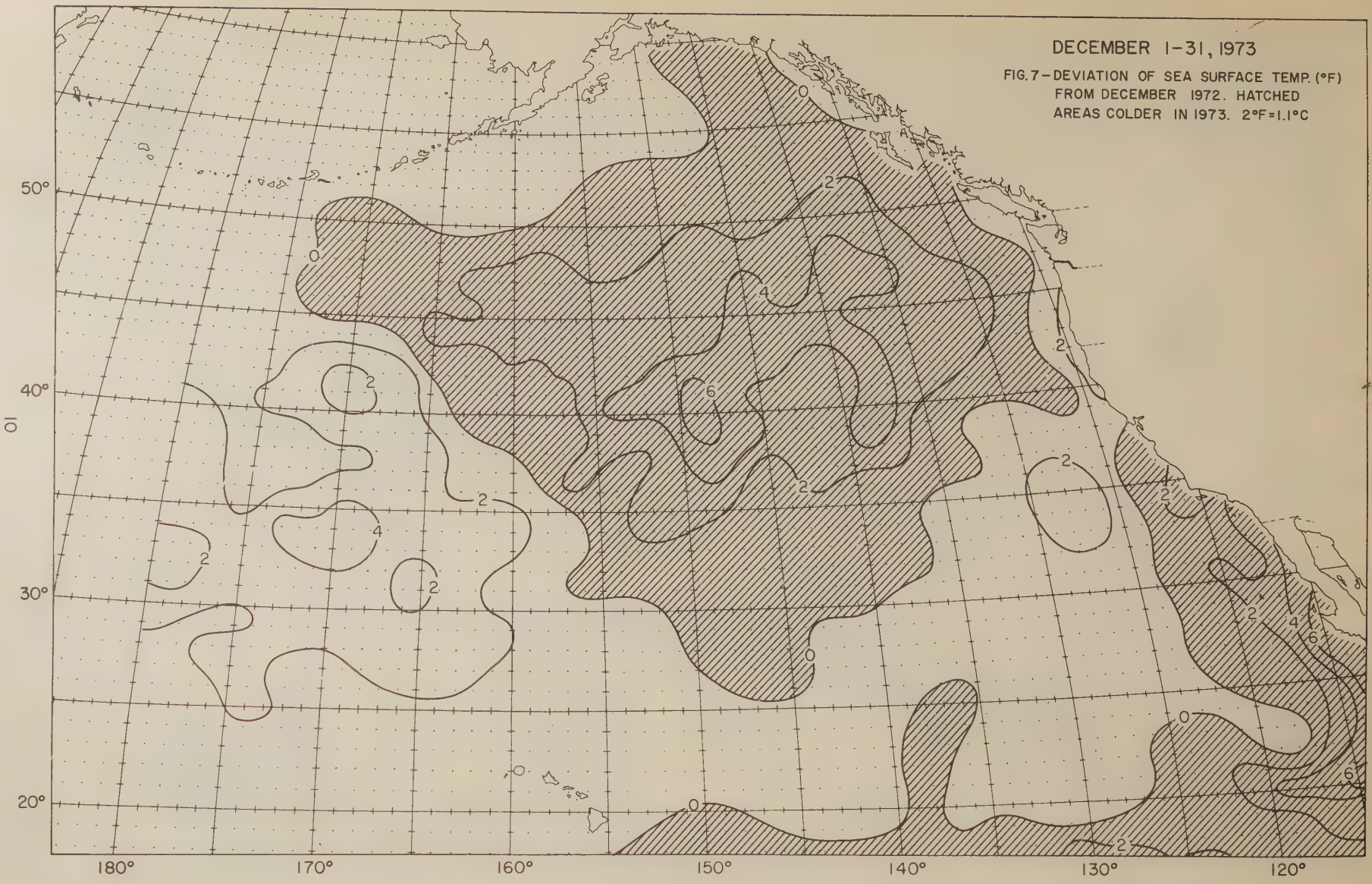

DECEMBER 1973
FIG. 2 - OBSERVED VALUES
—0000— BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.).
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
996
1000
1004
1008
1012
1016
1020
1020
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N
25 N.
20 N
180° W.
175 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

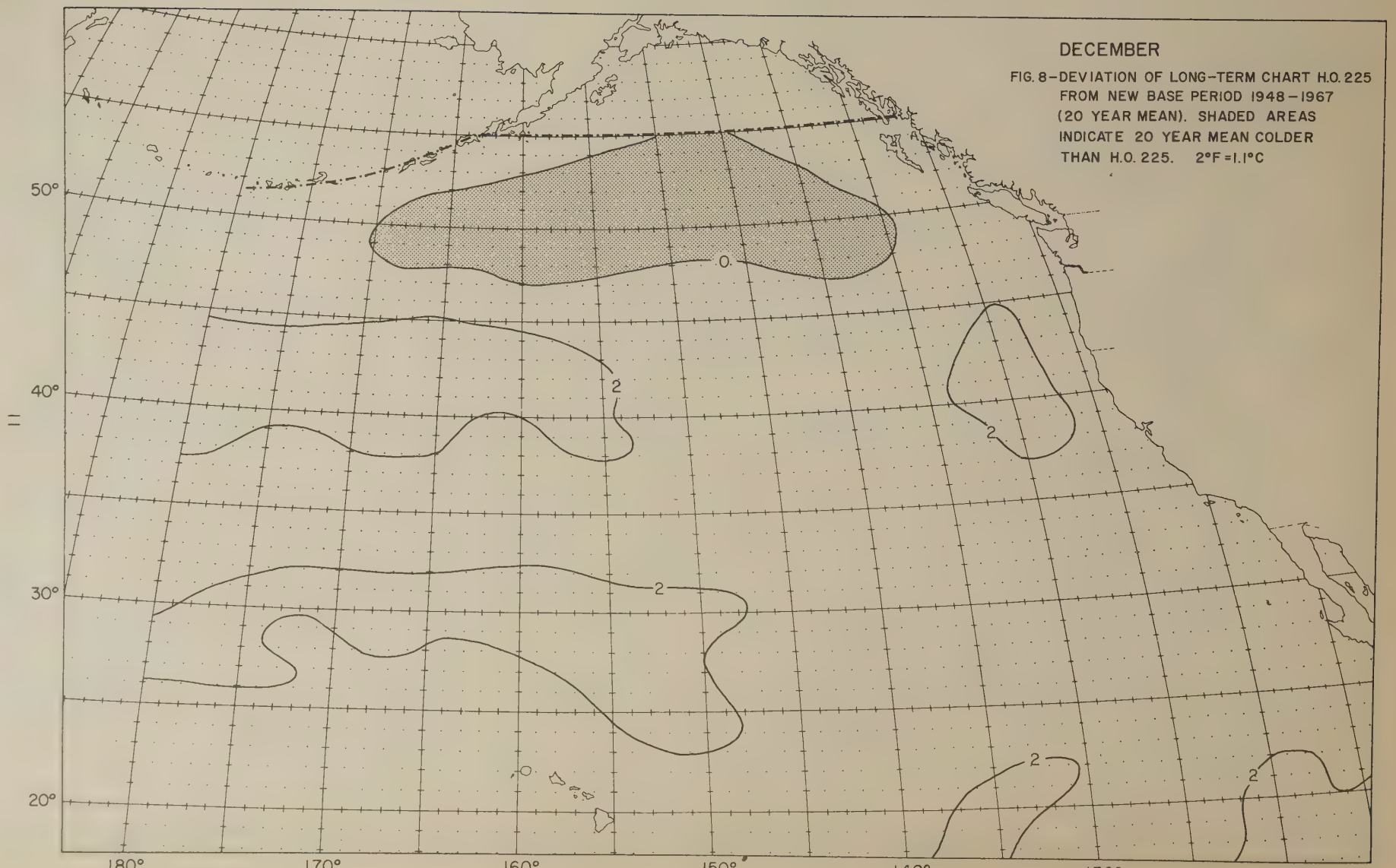

DECEMBER 1-31, 1973
FIG.3-MEAN SEA SURFACE TEMPERATURE (°F)
TEMPERATURE CONVERSION
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°

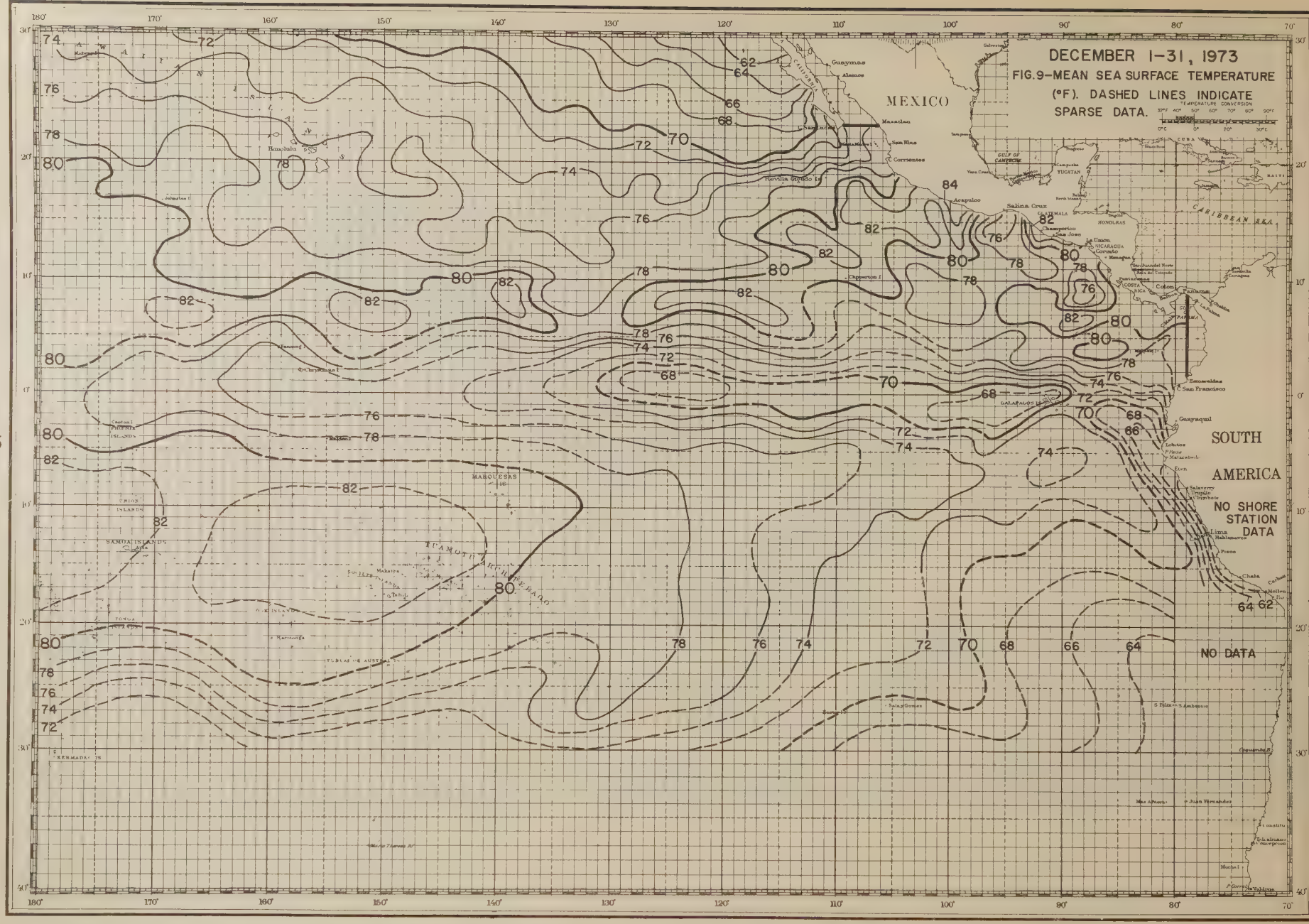

DECEMBER 1-31, 1973
FIG. 4-MEAN SEA SURFACE TEMPERATURE (°F)
36
38
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
80
82
84
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°


DECEMBER 1-31, 1973
FIG. 5-DEVIATION OF SEA SURFACE TEMP. (°F) FROM 20 YEAR MEAN (1948-1967). HATCHED AREAS COLDER IN 1973.
2° F = 1.1 °C
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
0
2
4


DECEMBER 1-31, 1973
FIG.6-DEVIATION OF SEA SURFACE TEMP.(°F)
FROM 20 YEAR MEAN (1948-1967).
HATCHED AREAS COLDER IN 1973.
2°F=1.1°C
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°
0
2


DECEMBER 1-31, 1973
FIG. 7 – DEVIATION OF SEA SURFACE TEMP. (°F) FROM DECEMBER 1972. HATCHED AREAS COLDER IN 1973. 2°F=1.1°C
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
0
2
4
6


DECEMBER
FIG. 8–DEVIATION OF LONG-TERM CHART H.O. 225 FROM NEW BASE PERIOD 1948–1967 (20 YEAR MEAN). SHADED AREAS INDICATE 20 YEAR MEAN COLDER THAN H.O. 225. 2°F = 1.1°C
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
0
2
2
2
2
2
0


DECEMBER 1-31, 1973
FIG.9-MEAN SEA SURFACE TEMPERATURE (°F). DASHED LINES INDICATE SPARSE DATA.
MEXICO
SOUTH AMERICA
NO SHORE STATION DATA
NO DATA
CARIBBEAN SEA
GULF OF CALIFORNIA
GALAPAGOS ISLANDS
MARQUESAS
SAMOA ISLANDS
TUAMOTU ARCHIPELAGO
Honolulu
Acapulco
Salina Cruz
Guaymas
Mazatlan
San Blas
Corrientes
Manzanillo
Champerico
San Jose
Corinto
Managua
Colon
Panama
Esmeraldas
San Francisco
Guayaquil
Salaverry
Trujillo
Chimbote
Lima
Callao
Pisco
Chala
Mollendo
Arica
Iquique
Antofagasta
Valparaiso
Juan Fernandez
Easter I.
Pitcairn I.
Tahiti
Papeete
Samoa
Tonga
Fiji Islands
Marquesas
Tuamotu Archipelago
Galapagos Islands
Cocos Islands
Caroline Islands
Marshall Islands
Gilbert Islands
Phoenix Islands
Line Islands
Tubuai Islands
Kermadec Is.
Mexico
Honduras
Nicaragua
Costa Rica
Panama
Cuba
Haiti
Jamaica
Yucatan
Campeche
Tampico
Veracruz
Galveston
TEMPERATURE CONVERSION
32°F 40° 50° 60° 70° 80° 90°F
0°C 5° 10° 15° 20° 25° 30°C

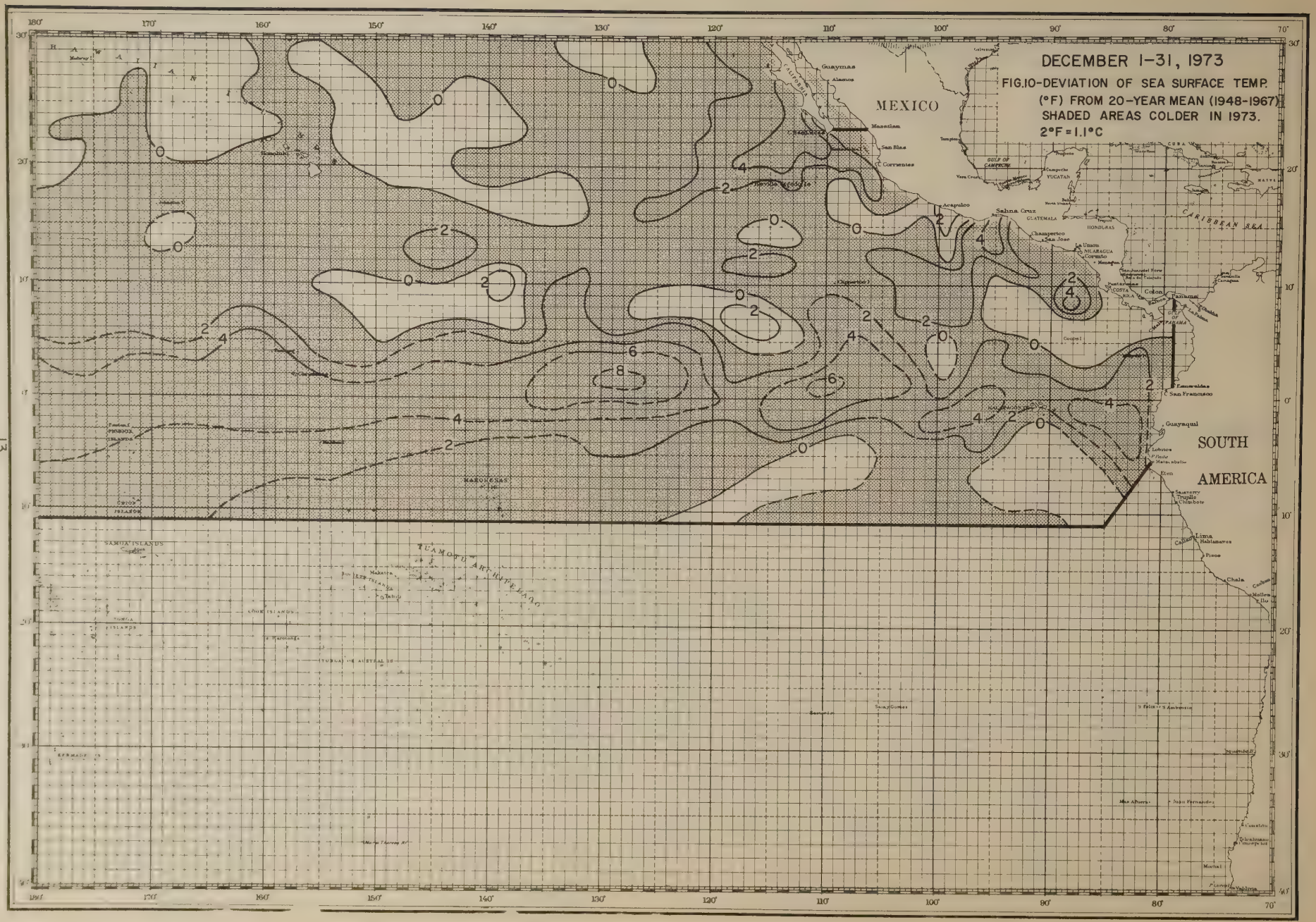
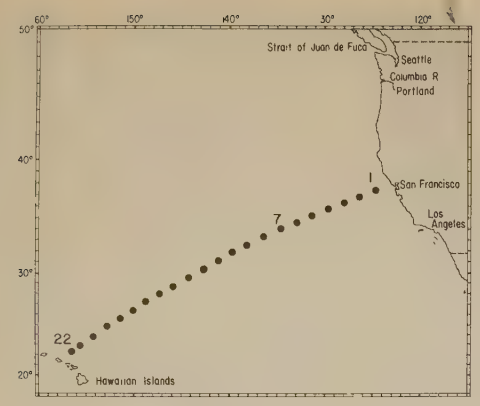
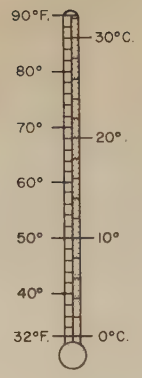

DECEMBER 1-31, 1973
FIG.10-DEVIATION OF SEA SURFACE TEMP. (°F) FROM 20-YEAR MEAN (1948-1967) SHADED AREAS COLDER IN 1973.
2°F = 1.1°C
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
HAWAIIAN ISLANDS
SAMOA ISLANDS
TUAMOTU ARCHIPELAGO
COOK ISLANDS
MARQUESAS
Guaymas
Mazatlan
San Blas
Corrientes
Acapulco
Salina Cruz
Champerico
Colon
Panama
Esmeraldas
San Francisco
Guayaquil
Lobitos
Eten
Salaverry
Trujillo
Chimbote
Lima
Callao
Pisco
Chala
Mollendo
Ilo
Arica
Iquique
Antofagasta
Valparaiso
Talcahuano
Corral
Puerto Montt
Chiloe
Chonos Archipelago
Tahiti
Makatea
Fakarava
Rapa
Easter Island
Juan Fernandez
Mas Afuera
San Felix
San Ambrosio

FIGURE 11





HONOLULU – SAN FRANCISCO

NOVEMBER 24–27, 1973

SS HAWAIIAN ENTERPRISE

VOYAGE 78

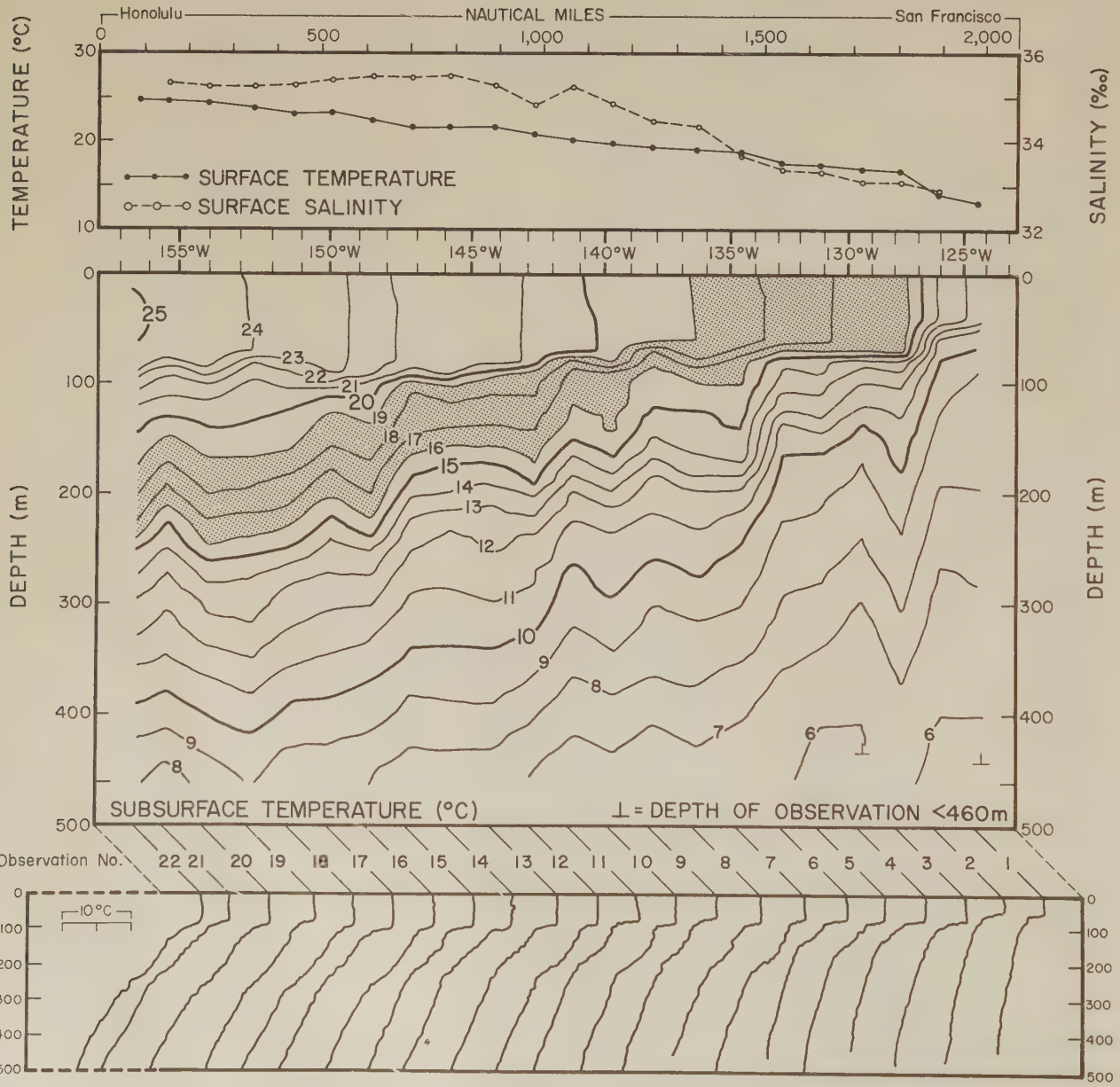
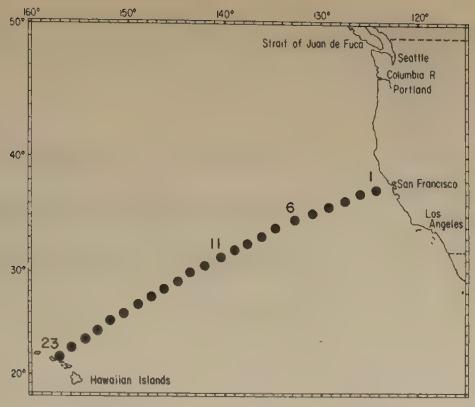
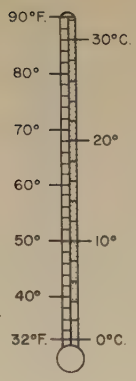


FIGURE 12





HONOLULU – SAN FRANCISCO

DECEMBER 8–12, 1973

SS HAWAIIAN ENTERPRISE

VOYAGE 79

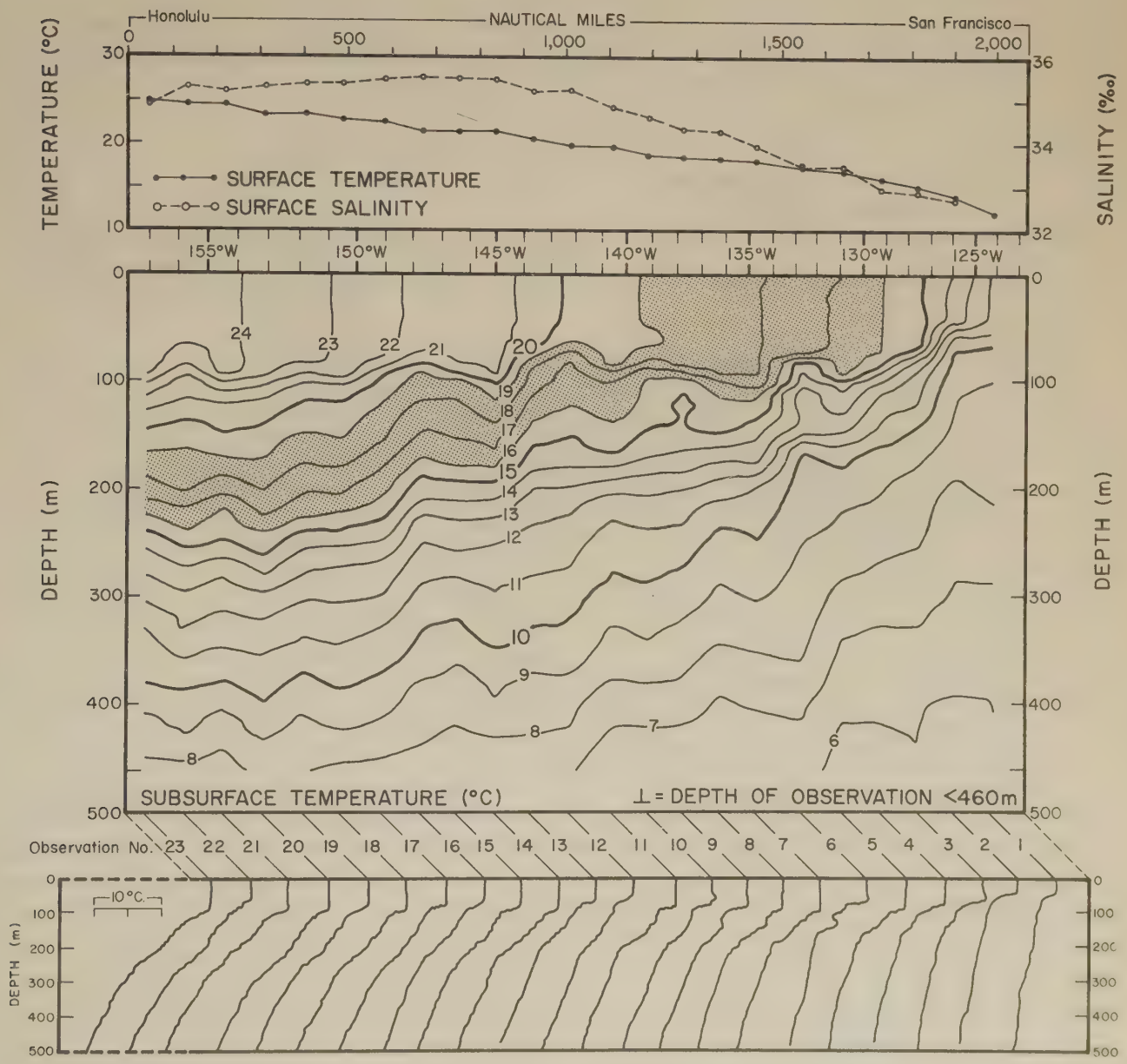
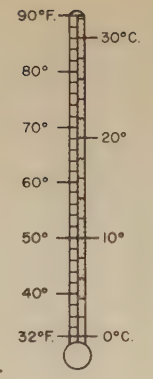


FIGURE 13



HONOLULU — LOS ANGELES

NOVEMBER 30 – DECEMBER 3, 1973

SS HAWAIIAN ENTERPRISE

VOYAGE 78

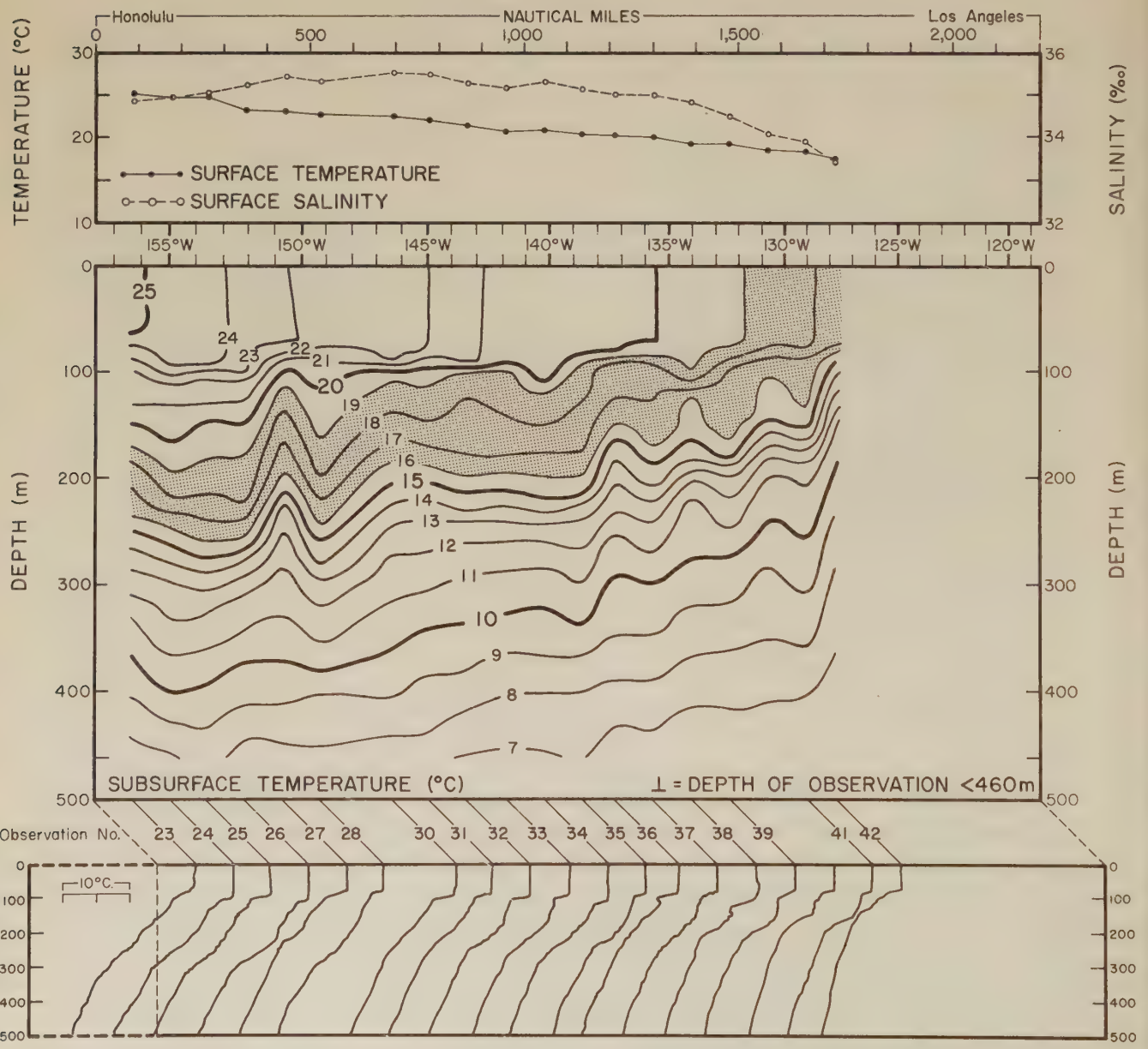
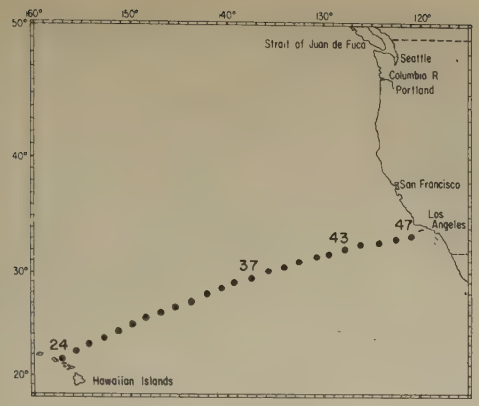
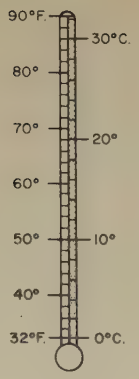


FIGURE 14



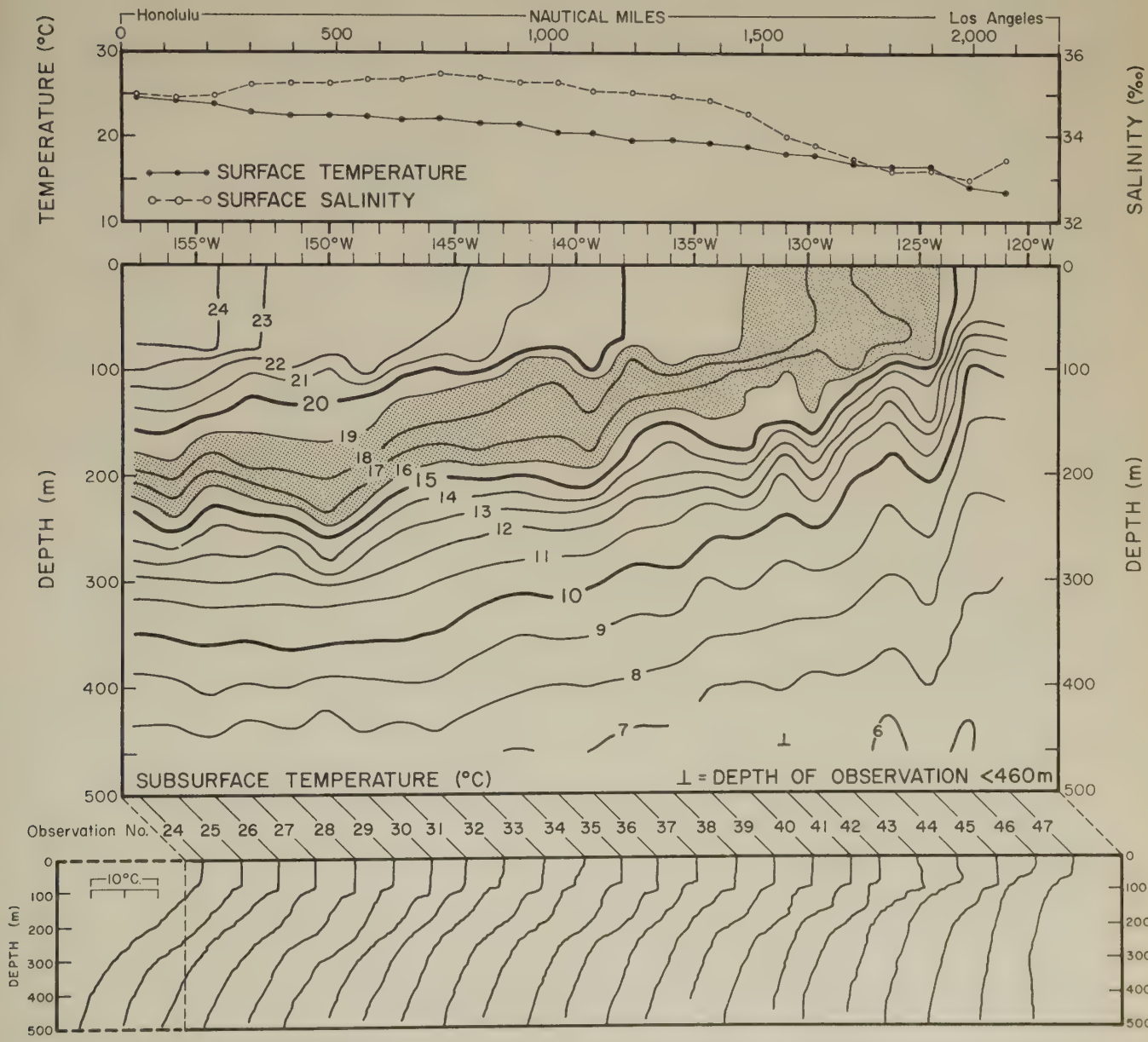


HONOLULU — LOS ANGELES

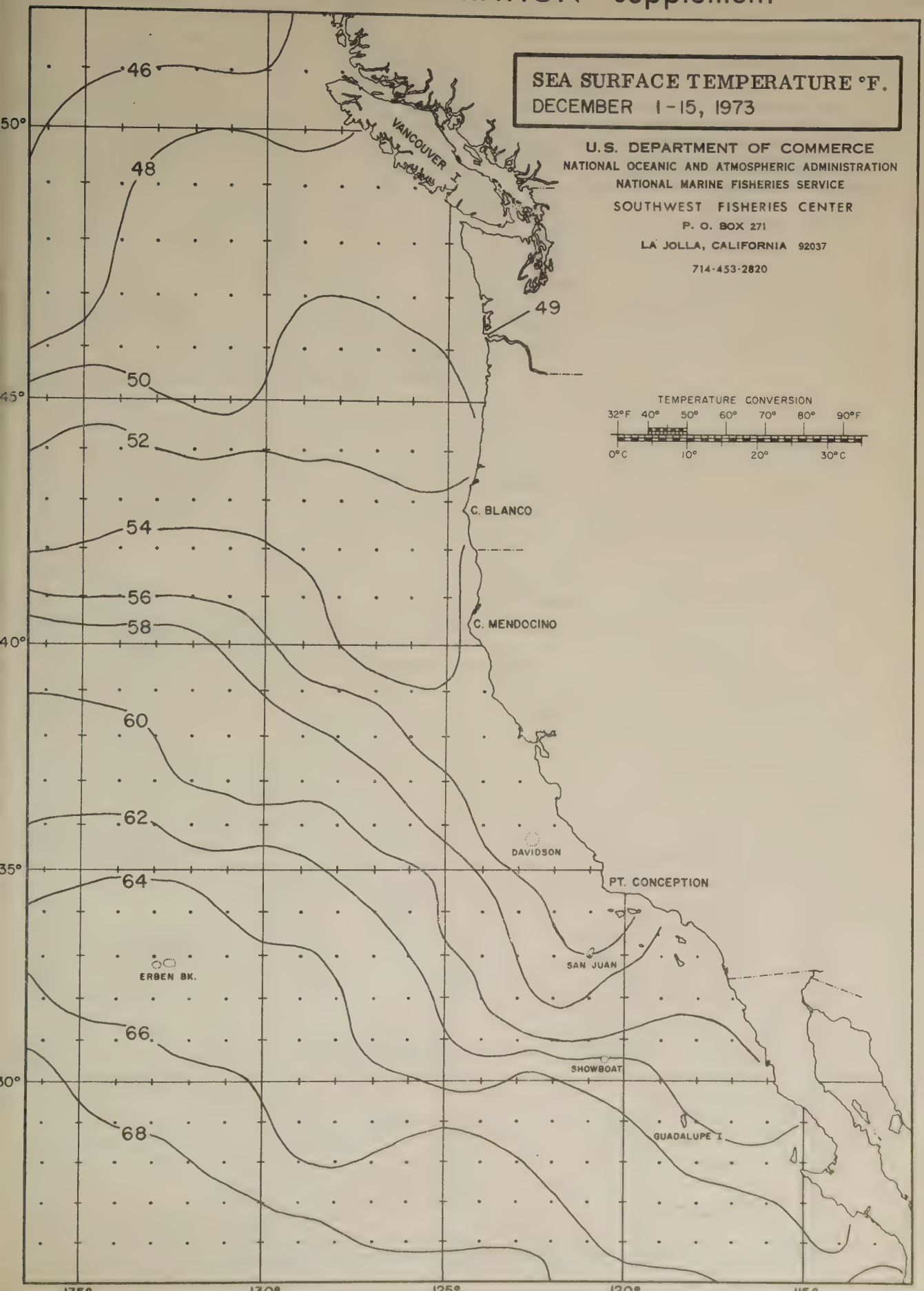
DECEMBER 14-18, 1973

SS HAWAIIAN ENTERPRISE

VOYAGE 79



FISHING INFORMATION – supplement



FISHING INFORMATION – supplement